

Notice of Allowability

Application No.

09/746,064

Examiner

B. William Baumeister

Applicant(s)

NIHEI ET AL.

Art Unit

2815

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to arguments filed 5/7/04.
2. ☒ The allowed claim(s) is/are 3-8, 10-13 and 15.
3. ☒ The drawings filed on 05 May 2002 are accepted by the Examiner.
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☒ All b) ☐ Some* c) ☐ None of the:
 1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

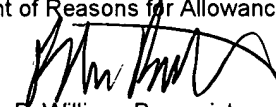
5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08),
Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413),
Paper No./Mail Date _____
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____

BRADLEY BAUMEISTER
PRIMARY EXAMINER


B. William Baumeister
Primary Examiner
Art Unit: 2815

DETAILED ACTION***Allowable Subject Matter***

1. Claims 3-8, 10-13 and 15 are allowed.
2. The following is an examiner's statement of reasons for allowance:
 - a. Applicant's arguments filed 5/7/04 are only partially persuasive, but do not serve as the bases for allowance. Applicant has previously argued that the 10 monolayers of TiO₂ disclosed by Imaizumi equates to a total thickness of 2.297 nm (Arguments dated 9/22/03). Then in the most recent reply, Applicant has alternatively argued that the 10 monolayers equates to 3.247 nm, and therefore does not read on "about 4 nm" (claim 10) nor "4 nm" (claim 15) (Arguments filed 5/7/04).
 - i. Assuming *arguendo* that Applicant is correct in asserting that the thickness of Imaizumi's TiO_x thickness is 3.247 nm, this thickness would at read on at least the claim 10 limitation of "about 4 nm." This is because 3.247 nm is not only on the same order of magnitude as 4 nm, but is less than a 1 nm difference. Applicant has nowhere defined "about 4 nm" to preclude reading on 3.247 nm. Any arguments to the contrary may raise 112-2nd paragraph indefinite issues, as the objective metes and bounds of what constitutes *about* 4nm would be brought into question.
 - ii. Adoption of applicant's assertion of Imaizumi's inherent or implicit teaching of 3.247 nm would also require further consideration as to whether it is sufficiently close to "4 nm" so as to sustain an obviousness rejection. However, this issue need not be resolved.

- iii. Applicant's conclusion that Imaizumi's TiO_x thickness is necessarily less than 3.247 nm is not well founded. Applicant bases this assertion on the presumption that Imaizumi's TiO_x is grown so as to have a (110) surface. This assumption was derived from the Zhang article submitted in the most recent IDS. However, Zhang merely states, "TiO_x (11) is one of the most studied oxides in surface science for both its importance in technical applications and its straightforward surface preparation." (page 242, col. 2.) The Zhang article is directed towards investigating the (110) surface of bulk TiO₂ samples (page 243, col. 2). Nothing in Zhang, or any other reference supplied by Applicant evidences that TiO₂ grown on a III-V semiconductor will grow so as to have a (110) surface orientation. As such, any calculations or assumptions about the unit cell dimensions for the (110) surface orientation do not necessarily apply to the situation of TiO₂ grown on III-V semiconductor materials.
- iv. Zhang does provide evidence that the unit cell dimensions for TiO₂ can extend at least between 3.0 Å and 6.5 Å depending upon the growth orientation (see e.g., FIG 7 at page 249). As such, applicant's arguments and submissions are persuasive to the extent of showing that (1) the crystal structure of TiO₂ is not cubic; (2) without knowing the inherent or implicit orientation of Imaizumi's TiO₂ film, the examiner cannot reach the conclusion that 10 monolayers will necessarily result in a thickness of 4 nm.

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b. However, the issue—of what Imaizumi's TiO₂ thickness actually is—need not be resolved. Upon further reconsideration, the examiner is of the opinion that the combination Imaizumi and Applicant's prior art does not reasonably establish a *prima facie* case of obviousness.

i. Applicant's prior art teaches that in the conventional situation that Au was used for the gate electrode, platinum was used as a barrier and Ti was used as an adhesion layer for adhering the platinum to the underlying III-V semiconductor layer. Even if the reasonably skilled artisan was motivated to combine Imaizumi to include a high barrier TiO_x film to Applicant's prior-art Schottky gate electrode, the prior art of record does not further teach that a Ti layer would adhere to the underlying TiO_x layer, or at least provide better adhesion than would a Pt/TiO_x interface. Restated, the prior art of record alone does not reasonably establish that the inclusion of the Ti adhesion layer would still be necessary or at least beneficial when the Au/Pt gate electrode is to be grown on TiO_x as opposed to being grown on a III-V semiconductor material.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

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Conclusion

3. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

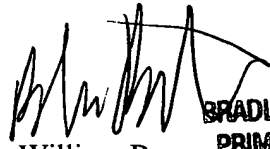
- a. Makiyama et al. '271 discloses a gate electrode on a GaAs-based semiconductor layer and composed of TiOx (17a) / Ti (17b) / Pt (17c) / Au (17d), but does not constitute prior art due to its filing date.
- b. Makiyama et al. '289 is a divisional application of the '271 patent.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to B. William Baumeister whose telephone number is (571) 272-1722. The examiner can normally be reached on M-F 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (571) 272-1664. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


B. William Baumeister
Primary Examiner
Art Unit 2815
**BRADLEY BAUMEISTER
PRIMARY EXAMINER**

August 15, 2004